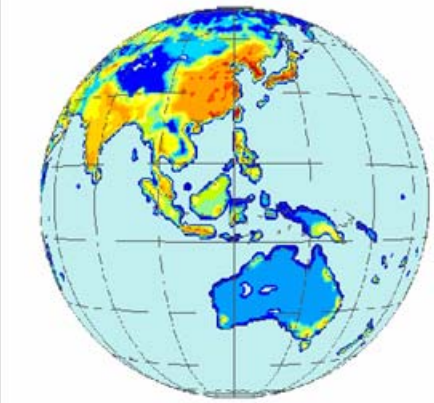
Asia-Pacific Scenario Quantification by AIM

-Contribution to Global Environmental Outlook 4-



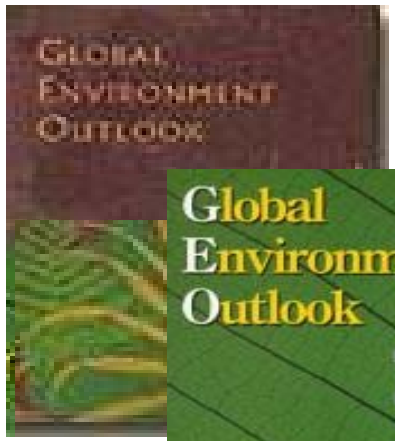
Yasuaki Hijioka, Toshihiko MASUI, Mikiko Kainuma, Osamu Akashi, Rajesh Nair, Yuzuru Matsuoka

12th AIM International Workshop, Tsukuba, NIES, 19-21 February 2007

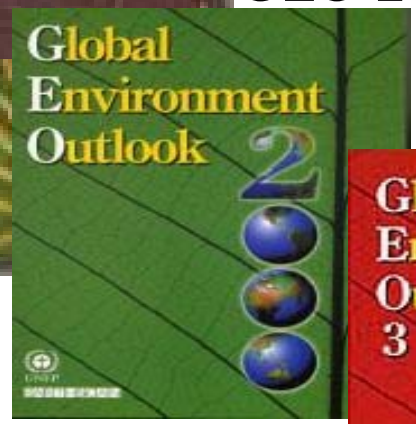
Global Environmental Outlook (GEO)

- The Global Environment Outlook (GEO) project is the implementation of UNEP's mandate to keep the global environment under review.
- GEO published three reports
  - GEO-1 in 1997
  - GEO-2000 (GEO-2) in 1999
  - GEO-3 in 2002 prior to the World Summit on Sustainable Development (WSSD)
- The consultative processes for the design of GEO-4 began in 2003 and will be published in December 2007.

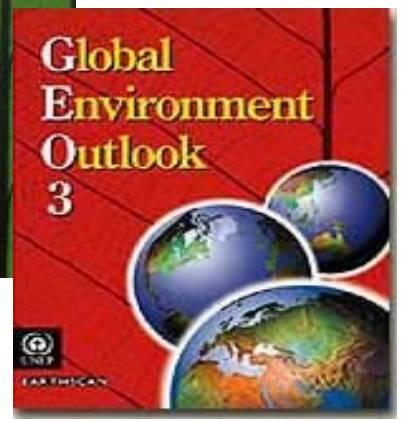
GEO-1（1997）



GEO-2（2000）



GEO-3（2002）



GEO-4 (Global Environmental Outlook 4) -Content-

- **Section A. Overview** (Chapter 1: Environment for Development.)
- **Section B. State of the Environment: 1987 - 2007**
  - State-and-trends in the four major themes (air, land, water, and biodiversity (Chapters 2 to 5)
  - Regionally significant environmental issues (Chapter 6) over the past 20 years.
- **Section C. Environmental Change - Human Dimensions**
  - Interlinkages (Chapter 7)
  - Challenges and Opportunities (Chapter 8 focuses on certain key cross-cutting issues)
- **Section D. The Outlook - Towards 2015 and beyond**
  - **Chapter 9** ***The Future Today***. short-term (up to year 2015) and medium-term (up to year 2050) and some long-term (up to 2100) scenarios
- **Section E. Environment for Development: Our Common Future**
  - Chapter 10 Policy Options. Synthesizes the overall policy relevant findings and conclusions of the GEO-4 assessment

Objectives of the Outlook Component of GEO-4

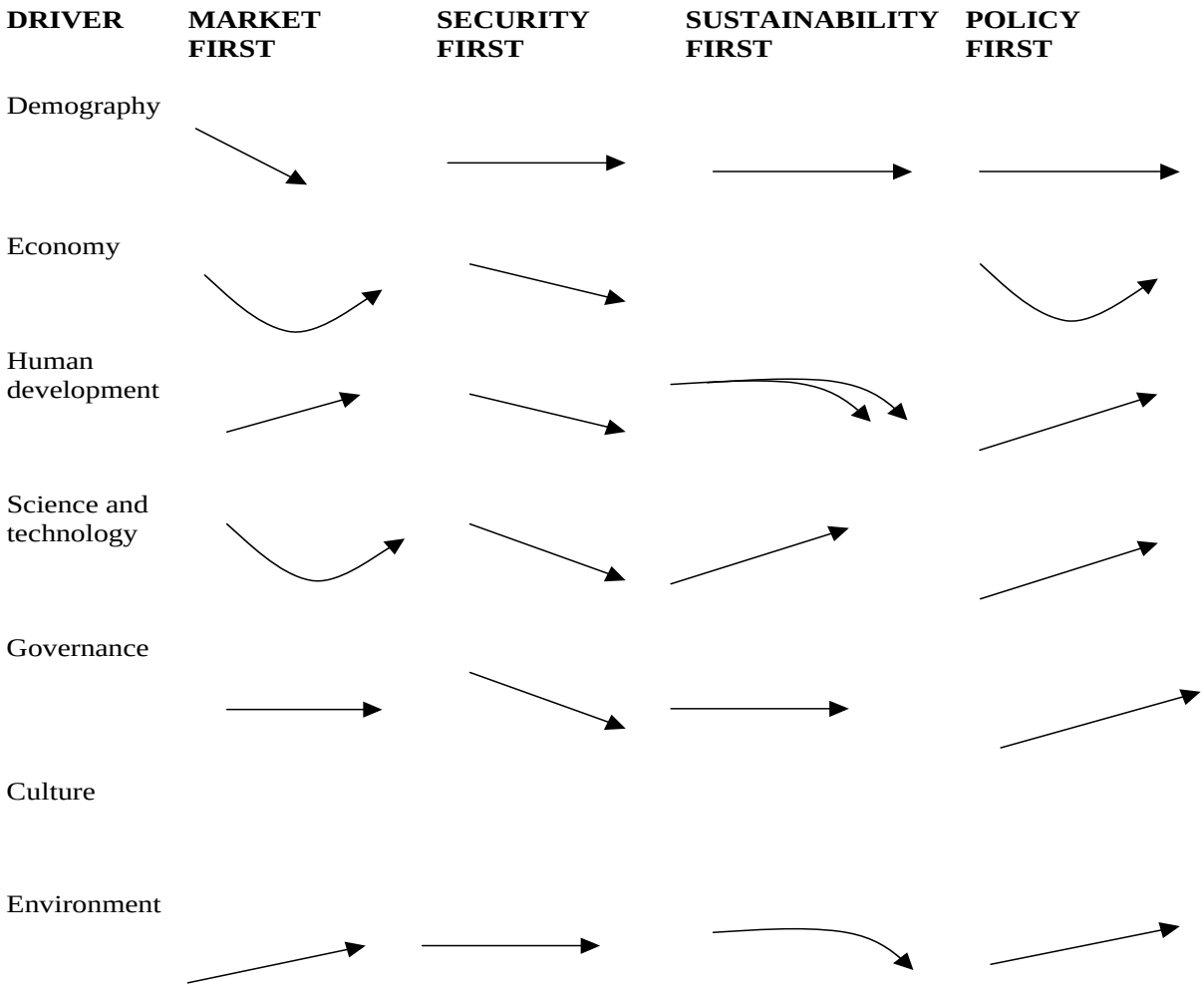
- Stick with GEO-3 Scenarios (MF, PF, SeF, SuF) for each GEO region
- Improve the global-regional and regional-regional links;
- Extend the time horizon from 2032 to 2050;
- Improve and extend the quantitative aspects;
- Extend the use of the scenarios for policy analysis;
- Improve the communicability of the scenarios; and
- Explore specific feedback loops between drivers and between outcomes and drivers within the scenarios.

  - Member of Chapter 9 consists of two teams, Storyline and Modeling team
  - Japanese AIM member : Storyline (Dr. Kainuma and Dr. Nair) & Quantification (Dr. Masui, Mr. Akashi. Hijioka) in Asia-Pacific region

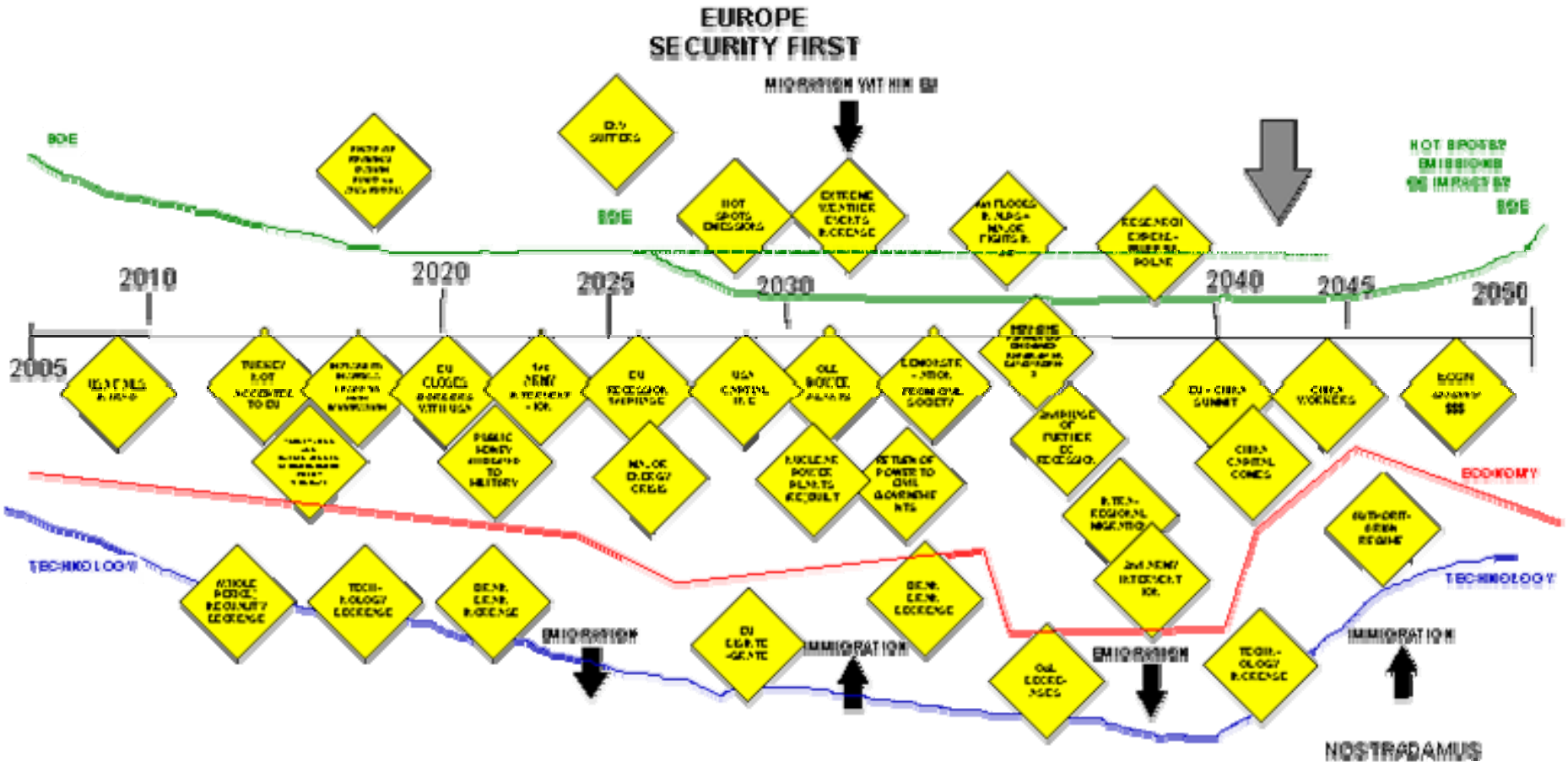
Storyline development

- **First step:** Discussion of regional key environmental issues in First Author's meeting, Nairobi (June, 2005)
- **Second step:** The first global and regional scenarios workshop of GEO-4 in Bangkok (September, 2005)
- **Third step:** Asia-Pacific group meeting on Scenario development for GEO 4 in Hua-Hin (January, 2006)

Storyline development -Bangkok Meeting-



Storyline development
-Bangkok Meeting-

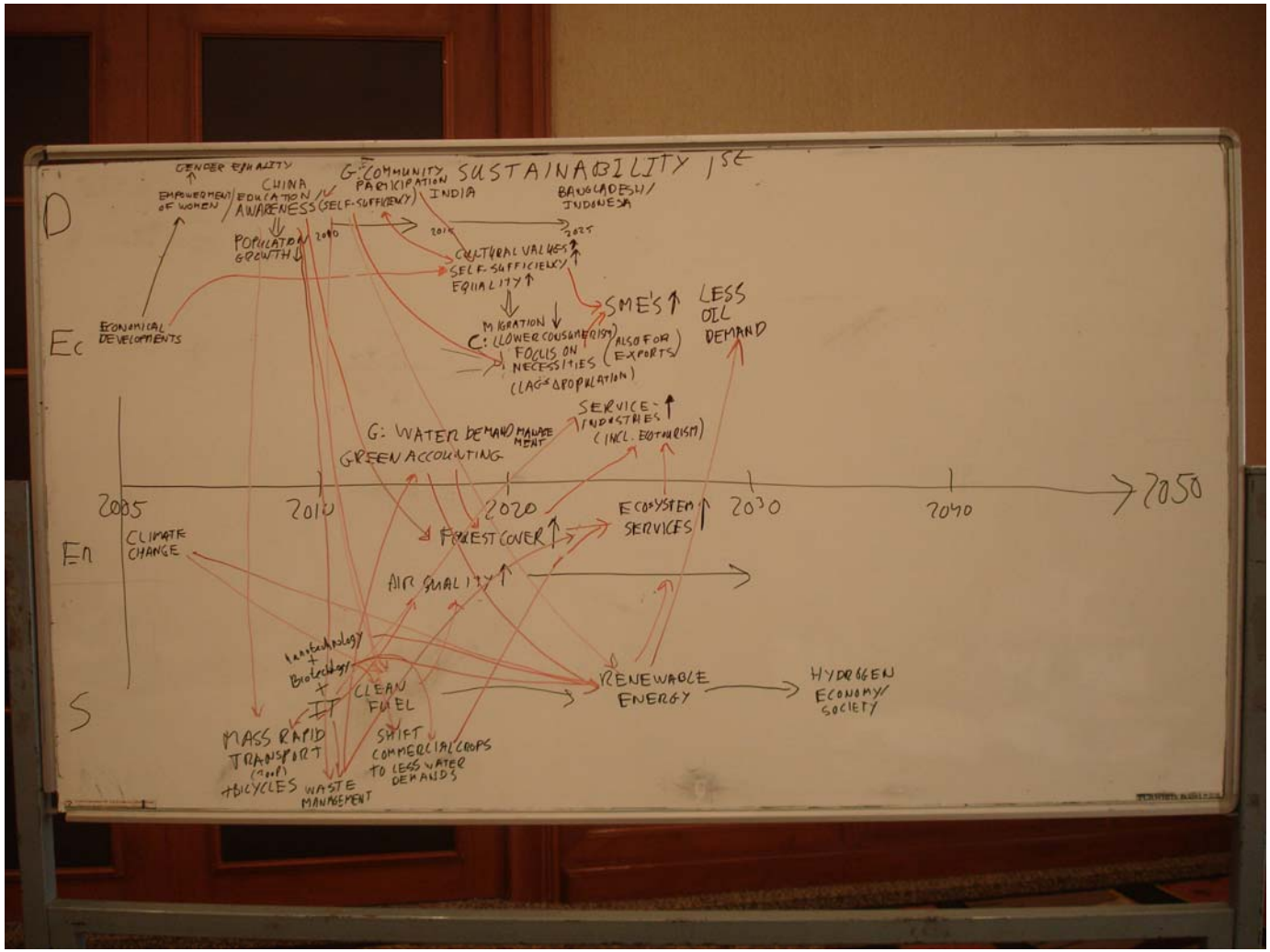


Asia-Pacific group meeting on Scenario development for GEO 4, -Hua-Hin Meeting-

- **Review of Bangkok Outputs**
  - The aim is to review what was achieved in Bangkok and note where work is needed

- **Revised timeline for each scenario (Divide into two group – two scenario per group)**
  - What happens to each of the priority issues in each scenario?
  - What are the significant events?
  - Revise timeline from Bangkok
  - Elaborate stories combining timelines and quantitative indicators, drivers, priority issues

Storyline development
-Hua-Hin Meeting-



Quantitative development

- Global Modeling Exercise – Linkage Between Models -

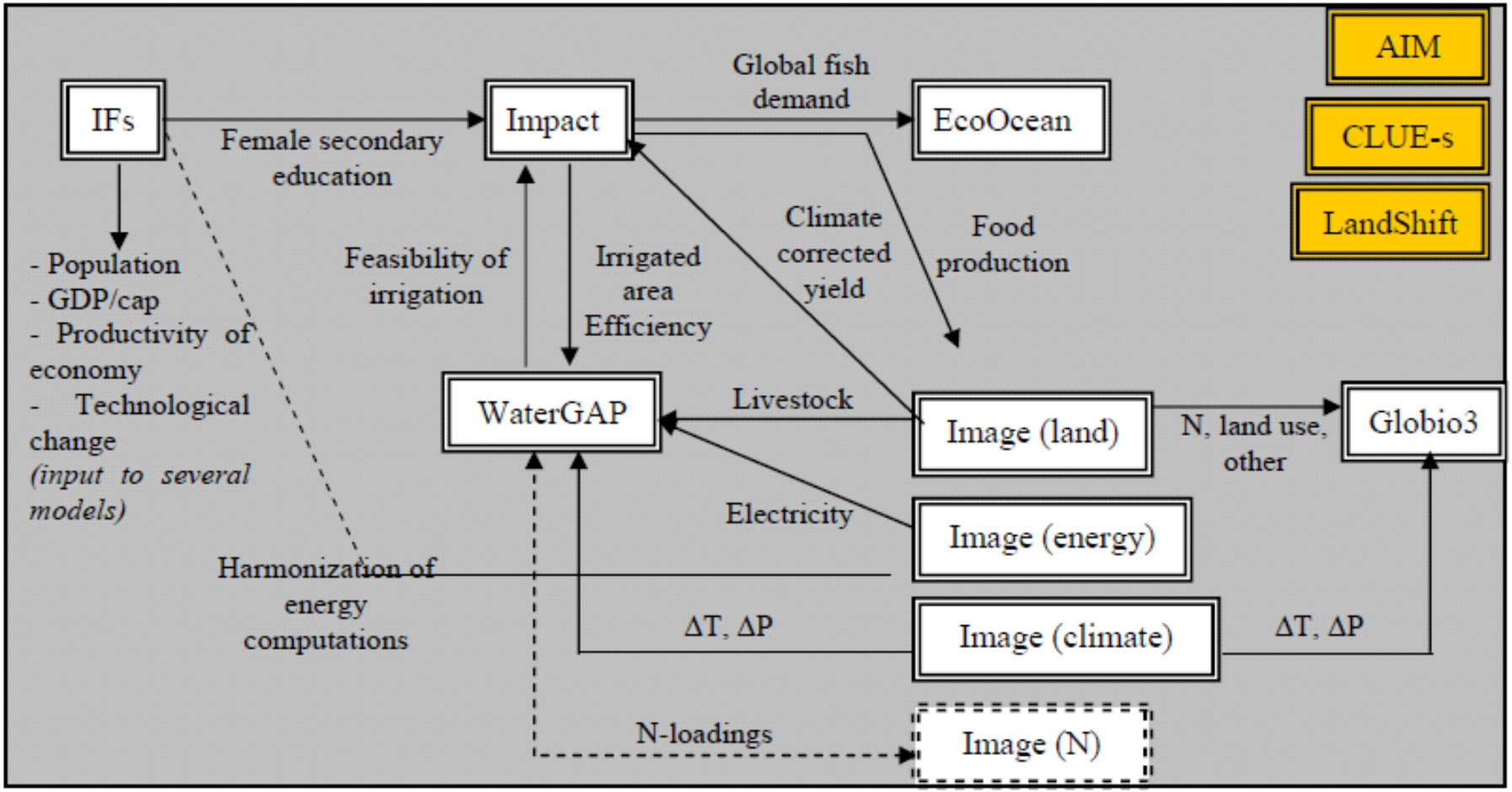


Figure 9.1 Illustration of the models used in GEO-4 and their main linkages
(AIM, CLUE-s, and LandShift are used to provide additional detail for certain regions)

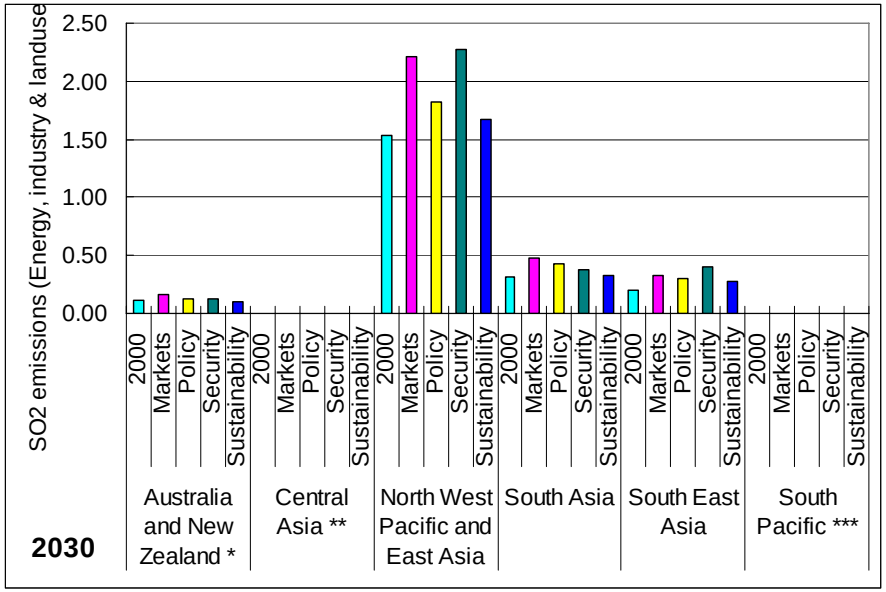
Quantitative indicators in GEO-4

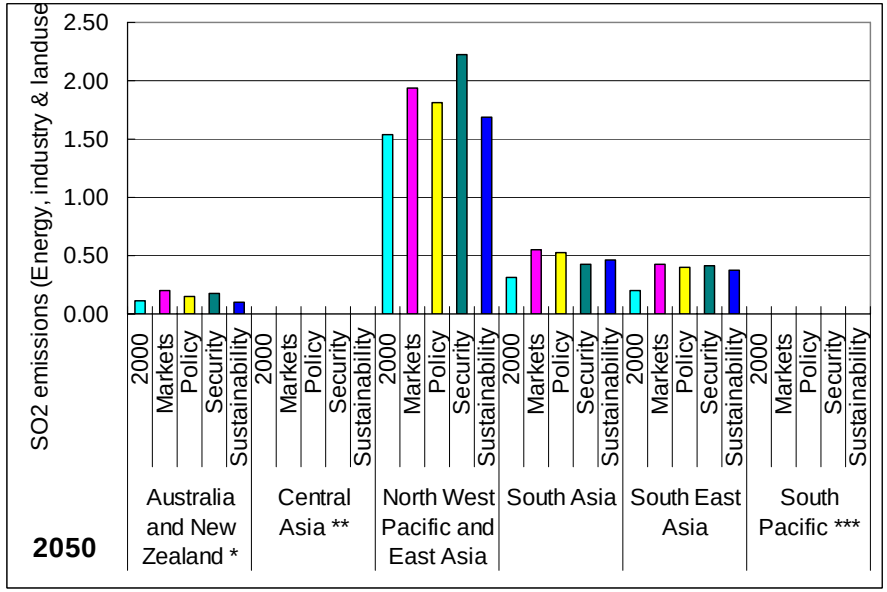
- **Demographic**
  - Total and urban population,
  - Ratio of Female to Male Enrolment as Share of Population of Appropriate Age,
  - Life expectancy at birth for different regions
- **Economic**
  - Various measures of income and income distribution,
  - Regional share (percentage) of global GDP.
- **Climate**
  - Total equivalent-CO_2 emissions (“Kyoto” gases),
  - Per capita equivalent-CO_2 emissions (“Kyoto” gases),
  - Global atmospheric CO_2 concentration,
  - Global surface temperature change relative to pre-industrial era,
  - Sea level rise relative to pre-industrial era.
- **Biodiversity**
  - Contributions to historic declines (by region) and change in impacts on biodiversity (globally) since 2000, by pressure,
  - Scenarios of biodiversity (maps)
- **Water**
  - Population living in river basins with severe water stress (ratio of withdrawals-to-availability more than 0.4),
  - Discharge of treated and untreated waster water (domestic and manufacturing sectors),
  - Changes in extremes of runoff between the current climate and 2050s (maps)
- **Food and Hunger**
  - Per Capita Food Availability and Childhood Malnutrition

Application of AIM Framework for GEO 4

- Indicators: Sub-regional level
  - Dr. Masui
    - ✓ CO_2 emissions (Energy, industry & landuse)
    - ✓ SO_2 emissions (Energy, industry & landuse)
    - ✓ NO_x emissions (Energy, industry & landuse)
    - ✓ Solid waste emissions
    - ✓ Agricultural land, Pasture and grass land, Forest area
  - Hijioka
    - ✓ Access to safe water and sanitation
- Indicators: City level
  - Mr. Akashi
    - ✓ CO emissions from urban passenger transport
    - ✓ NO_x emissions from urban passenger transport
    - ✓ PM emissions from urban passenger transport
    - ✓ CO_2 emissions from urban passenger transport

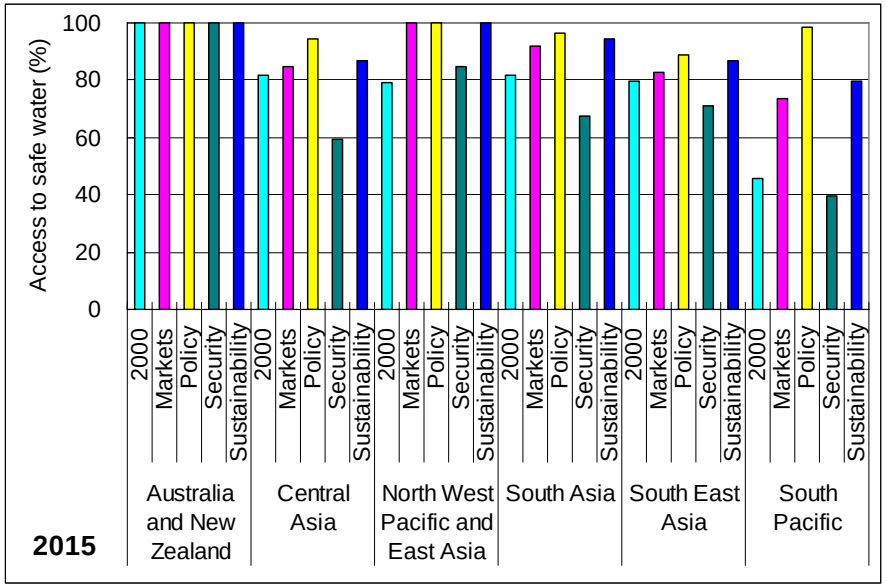
CO_2 emissions (Energy, industry & landuse) by Dr. Masui

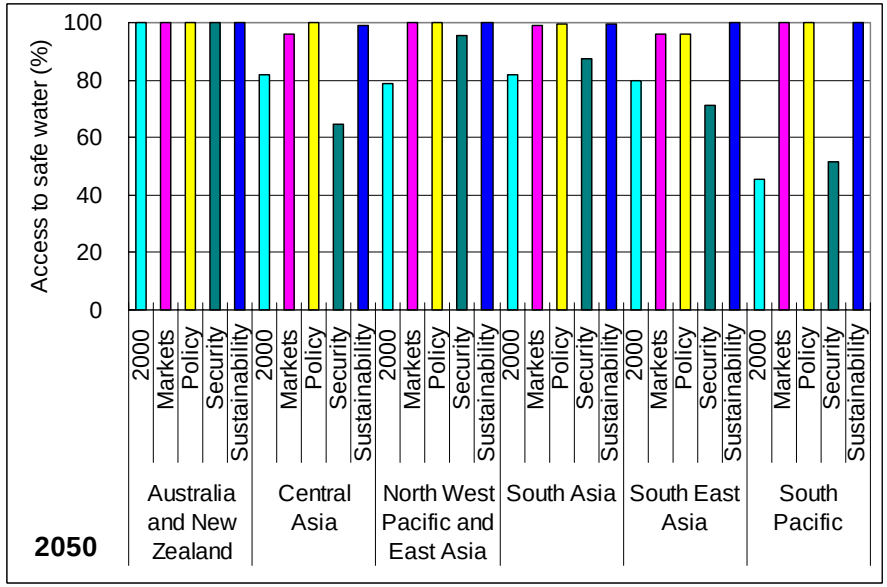




- In Market Fast scenario, the CO_2 emissions will increase due to the economic development. But the energy intensity will be improved.
- In Policy Fast scenario, CO_2 emissions themselves will increase in proportion to the rapid economic development. Compared to Market Fast scenario, the energy intensity will be improved more rapidly, and as a result, the CO_2 emissions will be mitigated.
- CO_2 emissions in Security Fast scenario will increase because of less technology development and mainly coal use. In Sustainability Fast scenario, CO_2 emissions will be similar to those in Policy Fast scenario.

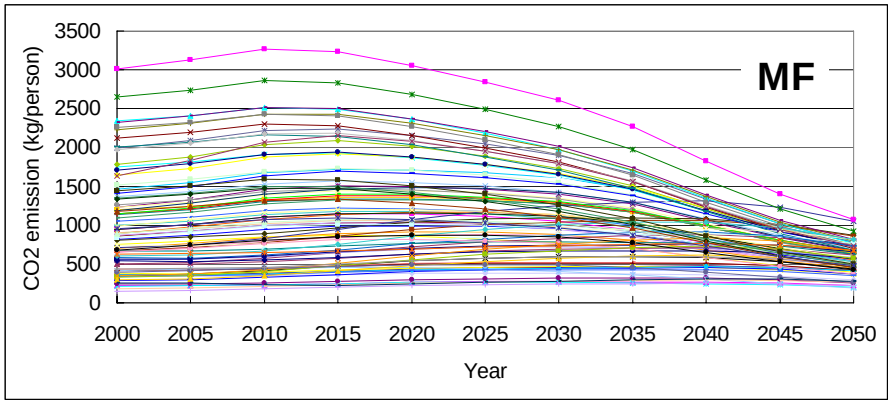
Access to safe water in 2015 and 2050 by Hijioka

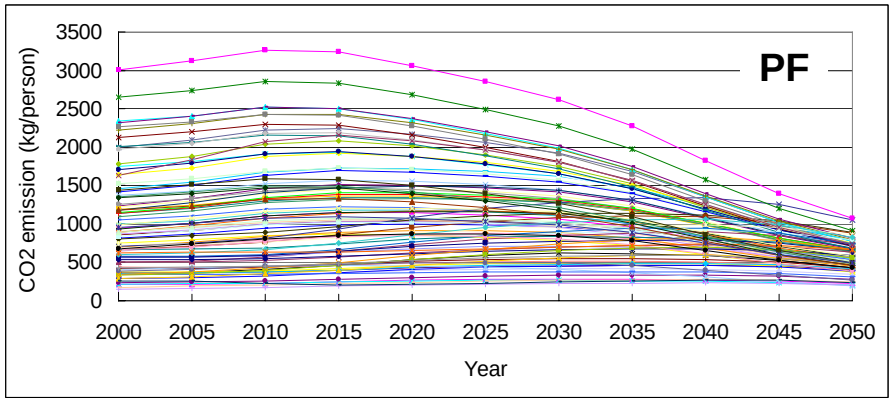


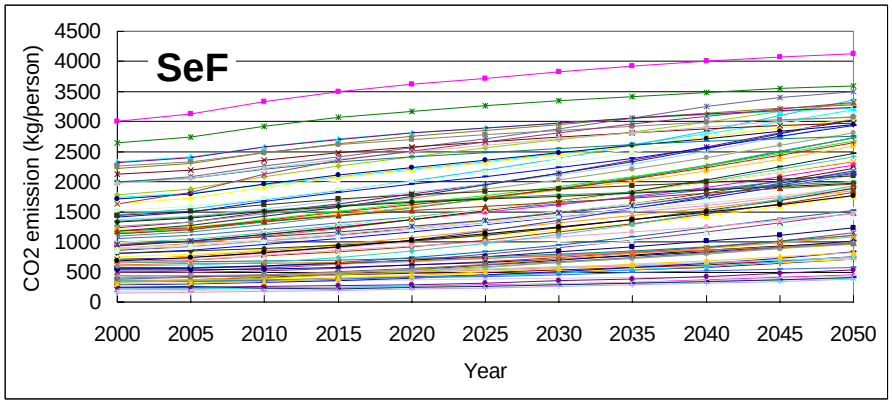


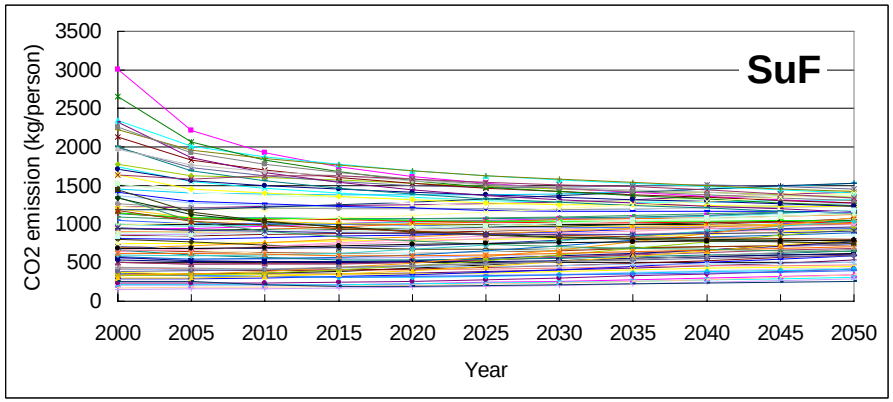
- PF almost achieves MDG in every sub-region due to not only economic growth but also highly improvement of management efficiency.
- MF and SuF achieve MDG in some sub-regions (North West Pacific and East Asia, South Asia, South Pacific) due to economic growth or improvement of management efficiency.
- SeF fails to achieve MDG and shows decease of access in all sub-regions except for North West Pacific and East Asia.
- In 2050, MF, PF and SuF almost achieve 100% access to safe water. However, SeF shows keep or decrease access except for North West Pacific and East Asia

CO_2 emissions from urban passenger transport at city level by Mr. Akashi









- In MF and PF, CO_2 emission increases until around 2015 and sharply decreases later. This is because hybrid vehicle and fuel cell vehicle start to be introduced after 2015 and 2030 respectively in those scenarios.
- In SeF, CO_2 emission increases, because advanced technologies are not introduced and transportation volume increase.
- In SuF, advanced technologies are not introduced. However, CO_2 emission decreases in most cities, because transportation volume curb as cities become more dense and compact.

Future tasks

- Reinforcement of environmental integrated assessment model development
  - Incorporating environmental assessment model into AIM/Ecosystem (CGE type model)
  - Development of new model to assess the policy for MDGs achievement

- How to link climate change research and other environmental issues
- Priorities of model development for quantification of environmental indicators

Thank you for your attention!

Structure of Water Management Model